Non-Destructive Detection and Separation of Radiation Damaged Cells in Miniaturized, Inexpensive Device, Phase I

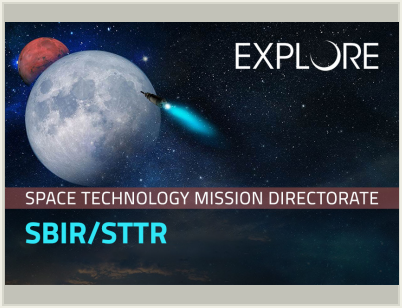
Completed Technology Project (2007 - 2008)

Project Introduction

There is a clear and well-identified need for rapid, efficient, non-destructive detection and isolation of radiation damaged cells. Available commercial technologies are expensive, require core facilities and use destructive methods. We propose to develop and demonstrate a novel fully automated, microfluidics-based device for identification and sorting of radiation damaged cells. The final product will be simple, small, inexpensive and fieldable in research environments as well as space. We will identify novel cell surface markers indicating radiation damage using a microarray (gene expression) experiments and verify downselected markers (protein upregulation) using fluorescent antibody tagged microparticles. CFDRC's proprietary dielectrophoretic cell sorter technology will be adapted for automated separation of the tagged damaged cells from overall population of cells. Proof-of-concept will be demonstrated by separation of damaged cells from an irradiated cell sample. Phase II efforts will focus along two primary lines. Surface biomarkers discovery will be further extended and validated. An integrated microfluidic cartridge and instrumentation capable of all operations (storage, mixing, sorting) will be developed. The prototype instrument will be demonstrated with both terrestrial and space radiation (in collaboration with NASA researchers/facilities). A multi-disciplinary team consisting of experts in microfluidics engineers (CFDRC) and radiation biologists (Temple University) has been assembled.

Anticipated Benefits

It is also expected that the developed technology will find ready applications in the following civilian markets: - Pharmaceutical and Drug Discovery Companies - Pre-clinical and Clinical Researchers (in particular stem cell and oncology researchers) - Hospital & Health Site Monitoring (for nuclear medicine, immune ex-vivo treatments)



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Ames Research Center (ARC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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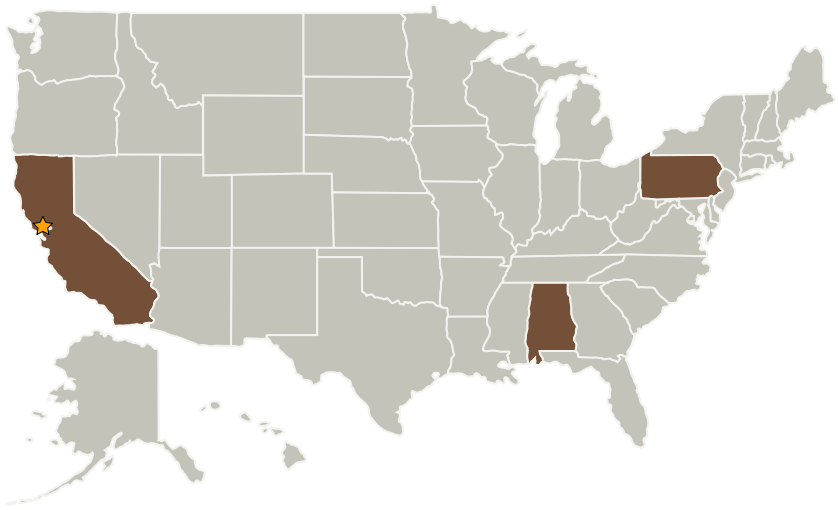
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Ames Research Center(ARC)	Lead Organization	NASA Center	Moffett Field, California
CFD Research Corporation	Supporting Organization	Industry	Huntsville, Alabama
Temple University	Supporting Organization	Academia	Philadelphia, Pennsylvania

Primary U.S. Work Locations	
Alabama	California
Pennsylvania	

Project Management

Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Project Manager:
Wenonah A Vercoutere

Principal Investigator:
Shankar Sundaram

Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
  - TX03.2 Energy Storage
    - TX03.2.2 Electrochemical: Fuel Cells